

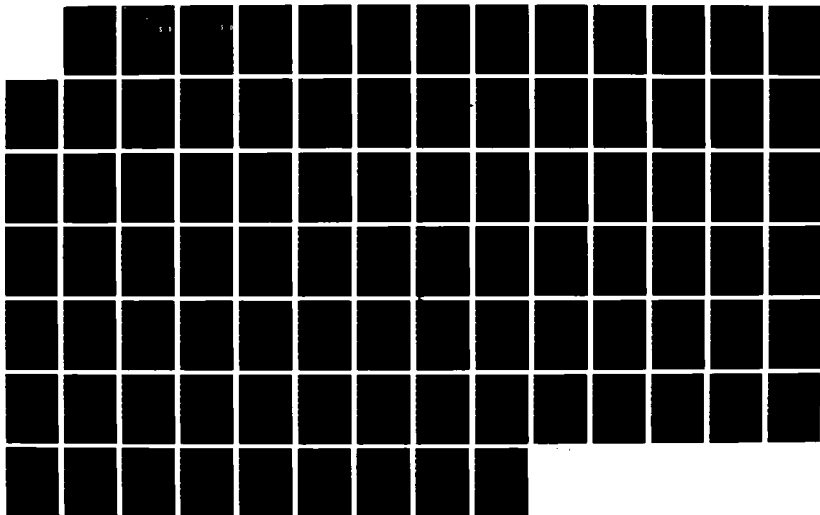
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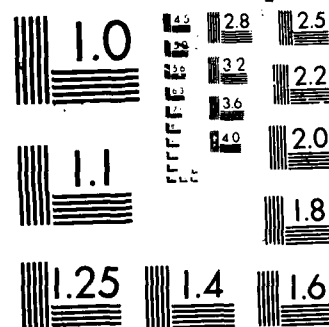
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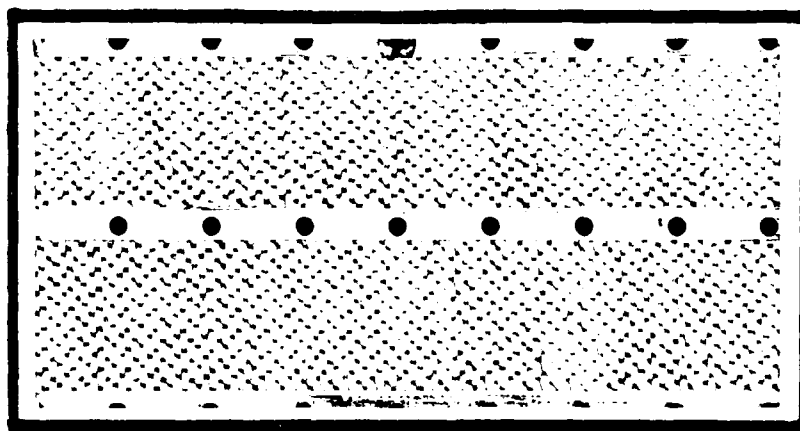




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AN EXAMINATION OF THE
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ARCHITECT-ENGINEER SELECTION
PROCESS OF AIR FORCE BASE
CIVIL ENGINEERS

THESIS

Mark S. Tissi
Captain, USAF

AFIT/GEM/LSR/87S-24

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AN EXAMINATION OF THE SELECTION CRITERIA USED IN THE
ARCHITECT-ENGINEER SELECTION PROCESS OF AIR FORCE BASE
CIVIL ENGINEERS

THESIS

Presented to the Faculty of the School of Systems and Logistics
of the Air Force Institute of Technology

Air University

In Partial Fulfillment of the
Requirements for the Degree of
Master of Science in Engineering Management

Mark S. Tissi, B.S.

Captain, USAF

September 1987

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Preface

The purpose of this study was to investigate the manner in which Air Force Base Civil Engineers (BCEs) in the United States select architectural-engineering firms (A-Es) for the procurement of design services. A review of the A-E selection criteria used by the BCEs indicated that differing interpretations of Air Force guidance exist. The study concluded with an A-E selection scoresheet depicting the aggregated views of the BCEs. The scoresheet included the selection criteria used most frequently and considered most important by BCEs to the overall goal of hiring highly qualified firms on a fair basis.

In conducting this research and writing its report of findings, I have benefited greatly from the learned advice of others. First, and foremost, I am deeply indebted to my thesis advisor, Captain Carl Davis, for his enthusiastic support, timely feedback, and especially his vast experience in research methods which served to guide me along a logical, coherent path of study. I also owe a word of thanks to my thesis reader, Lieutenant Colonel John Ballard, for ably overseeing the progress of the thesis and providing valuable insights.

Mark S. Tissi

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Abstract

This research examined the Air Force Civil Engineering process of selecting architectural-engineering firms (A-Es) for the procurement of facility design services. Sixty-two base civil engineers (BCEs) in 35 states provided their individual scoresheets indicating the specific criteria by which A-Es are evaluated and the range of possible scores for each criterion.

Descriptive statistical methods were used to determine the criteria most commonly used by BCEs and those which are most heavily weighted in the scoring process. The analysis included a comparison between the actual criteria used and the general categories of criteria outlined in Air Force Regulation (AFR) 88-31. Finally, the research used inferential statistical methods to identify differences in the application of selection criteria used by bases of differing major commands and geographic regions.

The study's findings included a pictorial representation of the aggregated scoresheets in the form of an A-E evaluation sheet. The evaluation sheet contained the criteria identified as those most frequently assessed by BCEs and weighted in proportion to their importance as perceived by the BCEs.

AN EXAMINATION OF THE SELECTION CRITERIA USED IN THE ARCHITECT-ENGINEER SELECTION PROCESS OF AIR FORCE BASE CIVIL ENGINEERS

I. Introduction

Overview

This chapter provides background information on this study's general issue, the focus of the study, its purpose and justification, its specific objective, and the scope of the study's application.

Background

In recent years, the Air Force has increased its reliance on architectural-engineering firms (A-Es) for professional services needed to construct new facilities and upgrade existing facilities. From the writer's experience, this reliance can be expected to increase further as reductions in the officer corps begin to take effect. As these reductions claim engineering design positions within base civil engineering (BCE) organizations, the use of A-E services will be even more necessary to meet the BCE mission to replace, repair, and maintain Air Force real property.

As reliance on A-E services increases, the importance of hiring qualified and competent firms increases. "Hiring the right architect/engineers (A/E's) and contractors is the most important contribution a manager can make to a project" (12:98). Therefore, the methods the Air Force uses to

narrow the field and select a competent A-E greatly impacts the quality of the final product or service delivered by the A-E. Such A-E services may take the form of facility design, supervision and inspection, factfinding studies, surveys, investigations, interior design, developing design criteria, preparing base comprehensive plans, or preparing action plans for hazardous waste cleanup (4:1).

The A-E service on which this study focused is facility design. Facility design refers to the creative process leading to the "production of designs, plans, drawings, estimates, specifications, and investigative work needed to execute a construction project" (4:1). The quality of this service can be gauged in different ways, but for the purpose of this study, quality is best defined by Barra as giving the customer "what is required, namely a product or service fit for use, and doing this in such a way that each task is done right the first time" (2:1).

Technical competition is the basis on which Air Force BCEs must select A-Es from a field of those bidding for a contract. This requirement stems from the Federal Acquisition Regulation (FAR) and Air Force Regulation (AFR) 88-31, Selecting Architect-Engineer (A-E) Firms for Professional Services by Negotiated Contracts.

Technical competition is a method employed to select a contractor where the qualifications of the contractor are of greater importance than the ultimate price of the contract or where the nature of the services to be procured make price competition impracticable. . . .

The A-E contracting procedure consists of four steps: (1) synopsis, (2) preselection, (3) selection, and (4) negotiation and award [8:24].

All A-E contracts expected to result in a fee greater than \$10,000 must be synopsisized in the Commerce Business Daily, a document published five days a week by the U.S. Department of Commerce (8:7). Contracts expected to be of a lesser amount need only be publicized in the local area of the project such as in local newspapers and at the base's contracting office (CO). The project synopsis must include a description of the project's scope, the factors by which responding A-E firms will be evaluated, and the relative order of importance of the evaluation factors (4:6).

A preselection board consisting of at least three officer or civilian members is convened no sooner than 14 days after the publication of the synopsis. This board applies the publicized evaluation factors to A-Es responding to the synopsis. An A-E is considered responsive by maintaining a general resume in the form of the Standard Form 254 at the base's CO, or by forwarding that form to the CO (3:5-6). The preselection board narrows the field of responding A-Es to a list of the six firms rated highest based on their evaluation, and forwards this list to a selection board (4:7).

The selection board is also comprised of at least three members, none of whom served on the preselection board for the contract to be awarded. This board reevaluates the six

highest firms based on factors similar to those of the preselection board. In addition, the selection board conducts interviews with these A-Es to sharpen the accuracy of their individual evaluations of the firms. This board then ranks the top three qualified firms and forwards their names to the base's CO (4:9).

The FAR provides that the CO "shall negotiate a contract with the highest qualified firm . . . at compensation which the [CO] determines is fair and reasonable. . . . Should the [CO] be unable to negotiate a satisfactory contract with the firm considered to be the most qualified . . . negotiations with that firm should be formally terminated. The [CO] should then undertake negotiations with the second most qualified firm. Failing accord with the second most qualified firm, the [CO] should terminate negotiations. The [CO] should then undertake negotiations with the third most qualified firm" (3:16). Andrews, in quoting a 1979 United States House of Representatives investigative report, noted that "less than two percent of contract negotiations are formally terminated with the top-ranked [A-E] firm" (1:17). Hence, the A-E ranked first during the preselection and selection steps will almost always be awarded the contract for design service.

Focus of the Study

Since the major determinant for contract award is the evaluation of A-E qualifications, it is the selection process on which this study focused. In particular, two characteristics of the A-E selection process were of primary concern. The first was the range of the specific criteria used to evaluate bidding A-Es. The FAR and AFR 88-31 direct that A-E selection criteria will include criteria based on the A-E's experience, capability, current workload, geographic location, status as a small business or minority-owned firm, and the amount of previous federal contracts. While the criteria must have a basis in the above factors, Air Force BCEs are generally free to choose the specific means by which these criteria are applied to A-Es. This leads to a question as to whether A-Es are evaluated similarly at different bases.

The second characteristic of concern was the relative importance of the specific criteria BCEs use to evaluate bidding A-Es. AFR 88-31 directs that each member of the preselection and selection boards will assign numerical ratings for each of the above listed categories of criteria. Each category and the range over which the maximum possible rating must fall are presented in Table 1. For example, a BCE may gauge an A-E's capability using specific criteria which the BCE deems appropriate. However, the sum of the maximum possible ratings of the criteria comprising the measure of capability must be between 20 and

30 points. This study used the maximum possible ratings as measures of the relative importance of the specific criteria as perceived by BCEs.

The federal government's objective in choosing these categories of criteria "is to assure an equitable distribution of A-E contracts among qualified firms, including minority-owned firms and firms that have not had prior government contracts" (3:14).

Table 1

AFR 88-31 Categories of Selection Criteria

=====	
Category of Criteria	Maximum Rating
=====	
Experience	20 - 30
Capability	20 - 30
Workload	10 - 20
Location	5 - 10
Small/Minority Business	10% of total allowed
Prior DOD awards	5 - 10
Dollar value of prior awards	<u>20</u>
Total points possible	66 - 132
=====	
(4:7-8)	

Statement of Problem

Since no study could be found which had examined the equitability of applying the selection criteria listed in Table 1, the problem for this research was to determine if Air Force BCEs in the United States used the guidance of the FAR and AFR 88-31 in the same manner. That is, are there differences in the way bases interpret the FAR and AFR 88-31?

Sources of Differences

While Air Force bases can be categorized in many ways, there are two characteristics of bases which may explain the source of differences which may arise. Consequently, the bases were grouped according to these characteristics to identify trends in the potentially various interpretations of the FAR and AFR 88-31. One source of difference was the major command (MAJCOM) to which the BCE organization is subordinate. The second characteristic was the A-E selection region to which the base belongs. These regions are geographically defined in AFR 88-31 as follows:

1. Region 1: Connecticut, Delaware, District of Columbia, Kentucky, Maine, Massachusetts, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, Virginia, West Virginia
2. Region 2: Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, Tennessee
3. Region 3: Colorado, Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, South Dakota, Wisconsin, Wyoming
4. Region 4: Arkansas, Louisiana, New Mexico, Oklahoma, Texas
5. Region 5: Arizona, California, Idaho, Montana, Nevada, Oregon, Washington

(4:11)

Purpose

The purpose of this study was to investigate the manner by which Air Force BCEs select A-Es for the procurement of design services. This investigation sought to determine

if any inconsistencies existed throughout the Air Force with respect to the specific criteria used in A-E selection and the weighting of these criteria. As a result of this investigation, an evaluation scoresheet was developed that pictorially represented the way the Air Force BCEs select A-Es. Knowledge of how BCEs select A-Es might help Air Force leaders determine if fair and consistent applications of selection criteria exist. To date, no research exists to help maximize objectivity and minimize subjectivity in A-E evaluations through an examination of how BCEs apply the FAR and AFR 88-31.

Specific Objective

The specific objective of this study was to develop an A-E evaluation form based upon how Air Force installations located in the continental United States (CONUS) interpret the FAR and AFR 88-31. The form included the most frequently used and important criteria which have their basis in one of the seven categories of criteria listed in AFR 88-31. This study also recommended a distribution of rating points for each criterion used in the selection process based on its importance relative to other criteria in its category and on the permitted range of the maximum rating defined by AFR 88-31. It was not the objective of this research to develop a better evaluation system. Adequate research is not yet available to determine the quality of the present selection process. However, the most

common criteria used to select A-Es were identified to assess the consistency with which A-E services are procured.

Investigative Questions

The above specific objective was met by examining the answers to the following investigative questions:

1. What set of criteria do BCEs use to select A-Es for design services?
2. What similarities and differences exist between the criteria used at bases and the categories of criteria in AFR 88-31 with respect to both content and relative importance?
3. What similarities and differences exist in the criteria used to select A-Es between bases of MAJCOMs and geographic regions with respect to both content and relative importance?

Scope

The scope of this study was the optimum set of criteria applied in appropriate proportions for the selection of A-Es for facility design in the CONUS. Other criteria, such as English proficiency and compliance with the Anti-Mafia Act, may be important outside the CONUS, but they would not likely appear on this study's proposed standard evaluation form. Similarly, criteria which are deemed important within CONUS may not have similar significance at overseas locations. In addition, the criteria used to select A-Es for facility design may not be suitable for the selection of designers of systems, such as weapons, computers, and intelligence networks.

Organization of the Thesis

The thesis is organized and presented in accordance with the model suggested in AFIT's Style Guide for Theses and Dissertations.

Chapter I contains an introduction to the study including the background of the issue, and a statement of the study's focus, problem, purpose, specific objective, investigative questions, scope, and organization.

Chapter II contains a review of literature relevant to the study's issue. Topics discussed include selection processes based on price, as opposed to technical, competition, and evaluation factors other than those listed in AFR 88-31.

Chapter III contains the methodology employed to gather information and the design used in the study for data analysis.

Chapter IV contains the major findings and analysis of the collected data and answers the investigative questions leading to the study's specific objective.

Chapter V presents an evaluation sheet based on the aggregated scoresheets of sampled bases, a summary of the study, and recommendations for the further research of the A-E procurement process.

II. Literature Review

Overview

This chapter compares and contrasts opinions expressed in recent literature on the use of technical competition as a basis for A-E evaluation. It also presents suggested additional selection criteria. This discussion provides a framework for the issue of DOD procurement of A-E facility design services.

Bases of A-E Evaluation

Technical competition is founded on the principle that the customer is best served with quality service through A-E competition of their technical qualifications. Architect and engineering societies have continuously endorsed this basis and have opposed the consideration of fee in the selection process. These societies warn that selections based on price competition would result in deterioration of the quality of services rendered (8:38). Prior to 1972, the architect and engineering industries' Professional Code of Ethics forbade their members from disclosing fees with their offers to render service in order to prevent cost comparisons with other bidding firms (8:42).

In 1986, William Moore wrote that competition based on A-E fees would seriously undermine the relationship between the selected firm and the client (9:228). He noted that A-Es, now perceived as trusted advisors and technical experts would be seen as competitive merchants with whom

the principle of caveat emptor must apply (9:228).

In 1987, Parks and McBride argued that when price competition is employed, the client must unilaterally define the exact scope of work so as not to give any one firm an unfair advantage. They noted that, under this burden, the client is depriving himself of the most precious assets offered by a qualified firm -- creativity, technical expertise, and analytical abilities -- in precisely the project's most important phase -- project definition (10:71). In terms of the project's expense, a few dollars of design cost may be saved in the short run, but substantially higher costs of construction and facility operation and maintenance will develop in the long run (10:71).

Writing in opposition, Andrews, in 1980, stated that government procurement of A-E services on the basis of technical competition invites fixing of prices by the A-E industry and prevents a truly open competitive market (1:17). This issue received Congressional attention in 1979 when the U.S. House of Representatives Committee on Appropriations on the Military Construction Appropriations Bill expressed a "desire to assure price be considered a factor in the selection of A-E firms but not the sole or primary factor" (1:18). Despite this and other similar proposals, no Congressional action has changed the 1972 Brooks Act, Public Law 92-582, which first established technical competition as the basis for government

procurement of professional A-E services (8:46).

Enacted by Congress in October 1972, the Brooks Act strengthened technical competition in the awards of A-E design contracts by establishing two requirements (8:17-18). First, the law requires the federal government to publicly announce its needs for A-E services, and to negotiate for a fair and reasonable fee on the basis of demonstrated competence and qualification (3:15). Second, the law requires the government to conduct discussions prior to this negotiation with at least three qualified and interested firms regarding anticipated design approaches for the required work (3:16).

The law's opponents argue the following:

1. A-Es can now fix prices for design services.
2. Favoritism and political corruption can be exercised without price competition.
3. A-Es have no incentive to lower prices.
4. Price comparison of the various proposals is precluded (8:46-47).

Supporters of technical competition and the Brooks Act argue the following:

1. An A-E's technical qualifications are more important than his fee.
2. Price consideration would dominate the selection criteria.
3. A-Es would be forced to cut corners on design efforts to stay competitive, resulting in losses of quality, innovation, and creativity.
4. The client would have to do a considerable amount of the engineering work himself (8:47; 10:69).

DOD position. Despite the warnings of potential corruption and the possibility of dollar savings, it remains the DOD, and USAF, position that:

1. Public Law 92-582 represents a reasonable balance of the conflicting objectives of a model A-E selection process.
2. Price competition does not enhance the selection of the best qualified firm.
3. Differences in A-E fees are negligible in comparison to the potential savings and benefits over the life of a project resulting from the selection of the most highly qualified firm, or conversely, the potential monetary loss resulting from the selection of a less qualified firm (8:49; 10:70).

In short, the DOD favors the existing basis of technical competition over a modified basis using A-E fees, or cost, as an evaluative criterion for selection.

Additional Selection Criteria

AFR 88-31 addressed the following categories of selection criteria: experience, capability, workload, location, small/minority business, prior DOD awards, and dollar value of prior DOD awards. AFR 88-31 directs that the set of selection criteria must include criteria from each of the above categories. What additional categories, if any, should selection boards consider to ensure a qualified firm is chosen?

Smith, in 1983, wrote that the selection criteria should include A-E references that have been directly investigated, and demonstrations of follow-through abilities (11:81). With its vast communications network, it appears

as though the DOD has an opportunity to apply this criterion. Shipyards, bases, and posts across the nation could coordinate with one another to check references' credibilities, assessments of A-E capabilities, and the satisfaction of the A-E's previous customers.

Moore, in 1986, suggested that clients choose A-Es which are compatible with themselves (9:225). He defined compatibility as a meshing of the firm's priorities such as construction cost, high dependability, life-cycle operating costs, and future adaptability. He noted further that this relationship is often the product of extensive, two-way communication, and the philosophical characteristics and specialties unique to the A-E firm (9:226).

Summary

This chapter examined arguments in the recent literature on the use of an A-E's fee as a criterion in evaluating firms in a competitive selection. While proponents of its use claim the fee criterion would prevent price-fixing and political corruption, DOD's position remains that quality service is best assured by excluding consideration of an A-E's fee in favor of the firm's technical qualifications. Its arguments include the assertion that fee differentials are negligible compare to the differences in future operations and maintenance costs resulting from the award to a lesser qualified firm.

Additional criteria suggested in the literature include consideration of references and a measure of the A-E's philosophical compatibility with that of the client. References should be investigated thoroughly with an emphasis on the ultimate satisfaction of the A-E's past clients.

III. Methodology

Overview

This chapter describes the steps which were taken to answer the investigative questions posed in Chapter I.

These questions were as follows:

1. What set of criteria do BCEs use to select A-Es for design services?
2. What similarities and differences exist between the criteria used at bases and the categories of criteria in AFR 88-31 with respect to both content and relative importance?
3. What similarities and differences exist in the criteria used to select A-Es between bases of MAJCOMs and geographic regions with respect to both content and relative importance?

Specifically, investigative questions 1 and 2 examined the equitability of applying the selection criteria among CONUS bases. Investigative question 3 was answered so that trends and preferences of MAJCOMs and regions would be identified.

Data Collection Procedures

Information to be analyzed in this study was gathered in response to a letter sent to 81 CONUS BCEs requesting information related to local policies on A-E selections. The 81 BCEs represent a census of all CONUS Air Force BCEs. The complete list of solicited bases appears in Appendix A. Representation was expected from at least 70 percent of the bases. The sample information was then analyzed and compared, and common elements were drawn from these

studies. The results of this study are expected to be highly generalizable to the total population of 81 CONUS Air Force bases.

The generalizability of results of this study, or its external validity, was a fundamentally important issue. External validity is the generality, or range of conditions to which the observations under study are relevant (6:35). Since maximum external validity was desired in this research effort, a poll of the entire population of CONUS Air Force BCEs was necessary.

A letter was sent to the BCEs of 81 CONUS Air Force installations. The letter requested a copy of any locally written policies used in the selection or evaluation of A-Es. At a minimum, the letter specifically requested a blank copy of the scoring sheet used at the base which indicates the specific criteria used by the preselection board, and the maximum possible points of each criterion. The letter also fully disclosed the purpose of the request, expressed appreciation for participation, and guaranteed anonymity of all responding bases to elicit maximum cooperation. A copy of the letter and the follow-up to it appear in Appendix B.

The criteria and maximum possible points for each criterion were extracted from each base's response to the letter. This information was entered into a database which included the base's name, sponsoring MAJCOM, and geographical region of the United States. The information

contained in the database and the method used to group the data into the AFR 88-31 categories are located in Appendix C. The appendix also contains operational definitions for each specific criterion. However, anonymity of all respondents was respected.

Data Analysis Procedures

Data analysis initially utilized descriptive statistics by arranging the responses to the request for information into several tables which are described later in this chapter. Descriptive statistics are the phase of statistics whose objectives are the organization and summarization of gathered data without seeking to draw inferences about a group larger than the contributors to the data (5:2).

Similarities and differences between MAJCOMs and geographic regions were analyzed by the use of one-way analysis of variance (ANOVA). In its simplest form, ANOVA is used to test the significance of the differences between the means of a number of different populations.

Use of ANOVA required several assumptions to be made about the population from which the data was gathered.

1. The level of the data gathered was at least interval. For example, this study measured criterion importance by the reported maximum possible points for the criterion. The assumption that the data level was interval means that the change in importance for a criterion from 10 to 15 points was equal to the change in importance from 15 to 20 points.

2. The populations from which the data were generated are all distributed normally with means and standard deviations that may or may not be unique.

3. The data were gathered in a random and independent process.

If further analysis was required to identify differences detected by ANOVA, the Bonferroni multiple comparison procedure was used. The Bonferroni procedure effectively computes an interval length as a function of the mean square error of the data. Where sample means differ by more than the value of computed interval, the difference in the true means is statistically significant. Where sample means differ by less than the value of the computed interval, the difference in the true means is insignificant, or the true means are essentially equal (5:358).

Data analysis was conducted through the use of the computer facilities at the Air Force Institute of Technology (AFIT), Wright-Patterson Air Force Base, Ohio. The SAS software system, a statistical analysis package installed on AFIT's Classroom Support Computer, contains procedures enabling the computation of means and variances of data, and the testing by the ANOVA and Bonferroni procedures described earlier. SAS's PROC MEANS procedure was used for means and variance computations, and the PROC ANOVA procedure with the BON option was used for hypothesis testing (7:49-60).

Steps for Investigative Question 1

Investigative question 1 asked, "What set of criteria do BCEs use to select A-Es for design services?" To answer the first investigative question, the data are presented in tabular form according to the range of used criteria

reported and the frequency of their use by the responding bases. Additional data in these tables includes the means of the maximum possible points attainable for each criterion. These tables present the collective application of AFR 88-31 guidelines by Air Force BCEs in showing the range of criteria evaluated and the relative importance of each criterion.

Steps for Investigative Question 2

Investigative question 2 asked, "What similarities and differences exist between the criteria used at bases and categories of criteria in AFR 88-31 with respect to both content and relative importance?" To answer the second investigative question, tables similar to those used for investigative question 1 were used. Each criterion, its maximum possible points, and the frequency of its use were placed in the appropriate AFR 88-31 category of criteria listed in Chapter 1, or the criterion was set aside as not fitting any of the seven categories. This step identified criteria being used and the relative importance of each criterion within each category. Then, within each category, the maximum possible points were summed for comparison with the AFR 88-31 range of maximum ratings.

Steps for Investigative Question 3

Investigative question 3 asked, "What similarities and differences exist in the criteria used to select A-Es between bases of MAJCOMs and geographic regions with respect

to both content and relative importance?" To answer the third investigative question, the data are again presented in tabular form similar to that for investigative question 1. To examine similarities and differences between MAJCOMs, a table was developed with criteria listed down the side, and each MAJCOM listed across the top. The overall MAJCOM means for each specific criterion were entered in the table. Then, the CONUS Air Force mean was included in the column for the criterion. ANOVA and Bonferroni analyses were then conducted to identify similarities and differences.

To examine similarities and differences between geographic regions, the same steps were followed as those for the comparison of MAJCOMs except that the words "geographic region" should replace the word "MAJCOM" wherever it appears in the steps above.

Steps for the Specific Objective

The specific objective of this study was to develop an A-E evaluation form based upon the most common criteria used by BCEs to select A-Es. To meet this objective, the most widely used and relatively important criteria were identified in each table. These criteria and their mean maximum possible points were placed in an appropriate AFR 88-31 category of criteria. Finally, for each category of criteria, the specific criteria were added to a standard evaluation form until the limit of the AFR 88-31 range of

maximum rating for the category was reached. The list of specific criteria on this form is the criteria used at the most bases and considered most important by those bases.

IV. Analysis of Data

Overview

The purpose of this study was to examine those factors of architectural-engineering firms (A-Es) which Air Force Base Civil Engineers (BCEs) use to select the most competent interested A-E. Additionally, various interpretations of AFR 88-31 were consolidated into a standard evaluation method suitable Air Force-wide for the procurement of facility design services. The analysis of data concerning the factors is presented in this chapter.

The chapter is divided into three parts: (a) a nationwide distribution of sample respondents is presented; (b) the general characteristics of selection criteria found in the sample of bases are examined; and (c) comparisons among different MAJCOMs and A-E selection regions are presented. Additionally, the three investigative questions posed in Chapter I and the study's specific objective are addressed separately based on the responses provided by the sample of BCEs.

Distribution of Respondents

Sixty-two, or 77 percent of the surveyed bases in 35 states responded to the request for information. A list of the respondents is presented in Appendix A.

The respondents to the request for information were clustered for the purpose of comparison into MAJCOMs and geographic regions of the United States. The MAJCOMs were

Air Force Logistics Command (AFLC), Air Force Systems Command (AFSC), Air Training Command (ATC), Military Airlift Command (MAC), Strategic Air Command (SAC), and Tactical Air Command (TAC). For ease of comparison, the geographic regions used were those defined in AFR 88-31. That regulation's five regions are:

1. Region 1: Connecticut, Delaware, District of Columbia, Kentucky, Maine, Massachusetts, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, Virginia, West Virginia
2. Region 2: Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, Tennessee
3. Region 3: Colorado, Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, South Dakota, Wisconsin, Wyoming
4. Region 4: Arkansas, Louisiana, New Mexico, Oklahoma, Texas
5. Region 5: Arizona, California, Idaho, Montana, Nevada, Oregon, Washington

(4:11)

Table 1 summarized the selection criteria as outlined in AFR 88-31. The table is repeated below as a convenience to the reader. The seven categories of criteria listed must be included in the A-E evaluation by the preselection and selection boards (4:7). Additional criteria based in other categories may be used in the evaluation process as deemed appropriate by the BCE. The permissible range of the maximum possible rating is further evidence of the BCE's flexibility in applying the guidance in AFR 88-31. For

example, the sum of the maximum points available from specific criteria used to gauge an A-E's experience may fall anywhere between 20 and 30 points. Those specific criteria are also chosen and weighted at the BCE's discretion.

Category of Criteria	Range of Maximum Rating
Experience	20 - 30
Capability	20 - 30
Workload	10 - 20
Location	5 - 10
Small/Minority Business	10% of total allowed
Prior DOD awards	5 - 10
Dollar value of prior awards	20
Total points possible	66 - 132 (4:7-8)

The distribution of the respondents by MAJCOM is shown in Table 2. The largest response came from SAC which was also the largest MAJCOM subset in the study's census. One base was placed in an unidentified MAJCOM to ensure its anonymity.

The distribution of the respondents by A-E selection regions is shown in Table 3. An acceptable level of representation among the respondents existed for each region.

Characteristics of Selection Criteria

Investigative question 1. The first investigative question asked what set of selection criteria is used by Air Force BCEs. The two characteristics of A-E selection criteria on which this study focused are the maximum possible points attainable for each criterion used and the

Table 2

Response by Major Commands

MAJCOM	Number of Bases	Percentage
AFLC	6	9.8
AFSC	5	8.1
ATC	11	17.7
MAC	8	12.9
SAC	19	30.6
TAC	12	19.3
OTHER	1	1.6
Total		100.0

Table 3

Response by A-E Selection Regions

Region	Number of Bases	Percentage
1	8	13.0
2	12	19.3
3	12	19.3
4	15	24.2
5	15	24.2
Total		100.0

frequency with which each criterion is used by BCEs.

Table 4 presents summary statistics from all CONUS bases for each criterion used to gauge A-E experience. Included are the number of bases in the sample using each criterion, the percentage represented by that number, and the mean of the maximum possible points attainable for each criterion among the bases using the criterion. The average maximum possible point value was obtained by calculating the

mean of the maximum ratings reported by the bases using a particular criterion. Thirty-two bases consider an A-E's specialized experience with similar work and 28 bases weigh the base's past experience with the particular A-E. These figures were computed from information sent by each base in the sample. While some bases used more than one specific criterion to assess an A-E's experience qualifications, all 62 bases in the study used at least one criterion to gauge this characteristic. This finding is indicated below by the 62 bases shown in the subtotal of the experience category.

Table 4
Average Maximum Ratings and Percent Usage
of Experience Criteria

Criterion	Number of Bases	Percent of Bases	Average Max. Points
General Experience	30	48	25
Specialized Experience	32	52	22
Past Experience	28	45	15
Subtotal of Experience Category	62	100	30

Tables 5 and 6 similarly depict the manner in which an A-E's capability and workload are assessed. Noteworthy is the fact that while one would expect all bases to use some measure of capability and workload in their assessment, since the two categories are specifically mentioned in

Table 5

Average Maximum Ratings and Percent Usage
of Capability Criteria

Criterion	Number of Bases	Percent of Bases	Average Max. Points
General Capability	20	32	28
Availability of Key Personnel	31	50	18
Technical Qualifications	17	27	16
Subtotal of Capability Category	58	94	24

Table 6

Average Maximum Ratings and Percent Usage
of Workload Criteria

Criterion	Number of Bases	Percent of Bases	Average Max. Points
General Workload	28	45	16
Capacity to Do the Work in Time	34	55	12
Subtotal of Workload Category	57	92	16

AFR 88-31, a few bases do not use any measures of these categories in their evaluations. This finding is indicated by numbers less than 62 in the subtotal of bases using the respective categories. However, the many who do measure these characteristics use ratings within the AFR 88-31

guidelines. As indicated in Table 1, the sum of all measures of capability should range between 20 and 30, while that of workload should be between 10 and 20.

Table 7 presents the summary statistics for the remaining 4 AFR 88-31 categories of criteria. Of the seven categories, the degree of compliance with AFR 88-31 is least with the two involving prior DOD awards. Seventy-six percent of the sampled bases considered the number of prior DOD contract awards, and only 63 percent considered the dollar value of those awards. Both criteria are included in the AFR 88-31 guidance summarized in Table 1.

Table 7

Average Maximum Ratings and Percent Usage
of Remaining AFR 88-31 Criteria

Criterion	Number of Bases	Percent of Bases	Average Max. Points
Location of Firm	61	98	10
Small/Minority Business	59	95	11
Number of Prior DOD Awards	47	76	8
Dollar Value of Prior Awards	39	63	18

Table 8 examines the statistics for 6 criteria which did not fit neatly into any of the 7 AFR 88-31 categories. The regulation provides for categories of criteria which must be included in the selection process, and permits BCEs

to supplement the evaluation with additional criteria such as those shown.

Cost control effectiveness refers to the A-E's ability to deliver the required work within its budgeted amount. Innovative design capability is generally measured by the board as the number of design competitions won by the firm being evaluated. The other supplemental criteria were a capability to inspect the construction as well as design it, the adequacy of the firm's organizational structure, its demonstrated use of computer-aided design or computer-aided manufacturing technology, and the existence of a toll-free telephone access to the firm.

Table 9 is a compilation of tables 4 through 8 and represents the collective total of specific criteria used by

Table 8

Average Maximum Ratings and Percent Usage
of Additional Criteria

Criterion	Number of Bases	Percent of Bases	Average Max. Points
Cost Control Effectiveness	11	18	10
Innovative Design Capability	11	18	10
Construction Inspection Capab.	6	10	9
Organizational Adequacy	7	11	11
CAD/CAM Capability	1	2	5
Toll-free Phone	1	2	10

Table 9
Average Maximum Ratings and Percent Usage
of All Categories of Criteria

Criterion	Number of Bases	Percent of Bases	Average Max. Points
General Experience	30	48	25
Specialized Experience	32	52	22
Past Experience	28	45	15
Subtotal of Experience Category	62	100	30
General Capability	20	32	28
Availability of Key Personnel	31	50	18
Technical Qualifications	17	27	16
Subtotal of Capability Category	58	94	24
General Workload	28	45	16
Capacity to Do the Work in Time	34	55	12
Subtotal of Workload Category	57	92	16

Table 9 (continued)

Average Maximum Ratings and Percent Usage
of All Categories of Criteria

Criterion	Number of Bases	Percent of Bases	Average Max. Points
Location of Firm	61	98	10
Small/Minority Business	59	95	11
Number of Prior DOD Awards	47	76	8
Dollar Value of Prior Awards	39	63	18
Cost Control Effectiveness	11	18	10
Innovative Design Capability	11	18	10
Construction Inspection Capab.	6	10	9
Organizational Adequacy	7	11	11
CAD/CAM Capability	1	2	5
Toll-free Phone	1	2	10
=====			
Average Total Possible Points			110
=====			

BCEs. This table shows that the evaluation process does vary among bases, particularly in the categories of criteria involving experience, capability, and workload. An example of this variety is that 28 of the sampled bases consider an A-E's past experience, while 32 do not. The other 32 bases choose to use other criteria to assess the A-E's experience qualifications. Bases are using different specific criteria to gauge A-E qualifications reflecting a possible lack of specificity in AFR 88-31's guidance.

Table 10
Comparison of Regulatory and Actual
Uses of A-E Selection Criteria

AFR 88-31 Category Of Criterion	Percent Frequency of Use	Average Max. Points
Experience (20 - 30)	100	30
Capability (20 - 30)	94	24
Workload (10 - 20)	92	16
Location (5 - 10)	98	10
Small/Minority Bus. (10% of total)	95	11
Prior DOD Awards (5 - 10)	76	8
Dollar Value of (20) Prior Awards	63	18

Investigative question 2. The second investigative question asked whether differences existed between the regulation's guidelines and the specific criteria actually

used to select A-Es. To answer this question, Tables 1 and 9 have been combined in Table 10 above. This table reports the frequency of use and average maximum possible points for each AFR 88-31 category of criteria. Comparing the averages with the permitted range of the maximum rating shows generally a high degree of compliance with the regulation's guidelines. It should be noted that the experience category was the only one used by 100 percent of the bases. For unreported reasons, all the other categories were used less frequently, and the AFR 88-31 categories dealing with prior DOD awards were used least frequently.

MAJCOM and Regional Comparisons

Investigative question 3. The third investigative question of this study examined the similarities and differences in the application of AFR 88-31 guidelines of A-E selection criteria between MAJCOMs and geographic regions. Table 11 reports the mean values of the maximum possible points attainable by MAJCOM for each of the 18 specific criteria reportedly used by the BCEs responding to the request for information. Additionally, the rightmost column of Table 11 reflects the average maximum points of all 62 respondents as reported in Table 9. This enables each MAJCOM's average maximum rating for each criterion to be compared to that of the entire sample. For example, for the AFSC bases which choose to consider an A-E's specialized

Table 11

Average Maximum Ratings
Available in Each Major Command

Criterion	Major Command					CONUS USAF	
	AFLC	AFSC	ATC	MAC	SAC	TAC	
General Experience	28	20	23	24	27	20	25
Specialized Exper.	30	17	20	26	28	15	22
Past Experience	0	10	22	15	17	12	15
Subtotal of Exper. Category	28	26	39	31	32	23	30
General Capability	30	30	25	28	27	30	28
Availability of Key Personnel	30	12	18	19	26	14	18
Technical Qualif.	0	0	19	13	16	8	16
Subtotal of Capability Category	30	17	30	23	26	16	24
General Workload	20	20	15	14	15	13	16
Capacity to Do the Work in Time	20	8	11	15	15	11	12
Subtotal of Wkld. Category	20	11	12	15	17	15	15

Table 11 (continued)

Average Maximum Ratings
Available in Each Major Command

Criterion	Major Command						CONUS USAF
	AFLC	AFSC	ATC	MAC	SAC	TAC	
Location of Firm	10	12	11	9	10	10	10
Small/Minority Bus.	11	12	13	11	10	10	11
Number of Prior DOD Awards	10	6	8	8	7	9	8
Dollar Value of Prior Awards	20	20	18	16	18	16	18
Cost Control Eff.	0	0	0	13	10	9	10
Innov. Design Cap.	0	0	0	12	0	10	10
Construction Insp. Capability	0	0	0	10	8	10	9
Organiz. Adequacy	0	0	0	0	11	0	11
CAD/CAM Capability	0	0	0	0	5	0	5
Toll-free Phone	0	0	0	0	10	0	10
Average of Total Possible Points	127	80	123	114	108	104	110

Table 12

Average Maximum Ratings
Available in Each A-E Selection Region

Criterion	A-E Selection Region					CONUS USAF
	1	2	3	4	5	
General Experience	28	15	23	28	28	25
Specialized Experience	20	24	27	22	20	22
Past Experience	16	16	17	10	15	15
Subtotal of Experience Category	27	30	33	28	31	30
General Capability	28	29	28	27	20	28
Availability of Key Personnel	14	19	29	21	13	18
Technical Qualifications	11	17	14	20	18	16
Subtotal of Capability Category	20	24	30	24	22	24
General Workload	16	11	16	18	16	16
Capacity to Do the Work in Time	13	13	13	13	11	12
Subtotal of Workload Category	18	15	15	16	14	15

Table 12 (continued)

Average Maximum Ratings
Available in Each A-E Selection Region

Criterion	A-E Selection Region					CONUS USAF
	1	2	3	4	5	
Location of Firm	8	12	11	10	10	10
Small/Minority Business	10	12	11	11	11	11
Number of Prior DOD Awards	7	8	8	8	9	8
Dollar Value of Prior Awards	14	19	20	20	14	18
Cost Control Eff.	8	10	0	10	11	10
Innovative Design Cap.	5	10	0	10	12	10
Construction Inspection Capability	0	10	8	10	10	9
Organizational Adequacy	13	0	12	10	10	11
CAD/CAM Capability	0	0	5	0	0	5
Toll-free Phone	0	0	10	0	0	10
Average of Total Possible Points	99	112	114	115	107	110

experience, the average of their maximum ratings for that criterion was 17. The CONUS Air Force average was 22.

Table 12 presents the means of the maximum possible points by A-E selection region for the set of specific criteria. As in Table 11, the CONUS Air Force means for each criterion are also shown as calculated from the sample's responses. The average maximum rating available from a base in region 4 which chooses to consider an A-E's capacity to do the work in time is 13, as compared to the sample's average of 12.

The summarization of MAJCOM and regional averages in Tables 11 and 12 suggests there is variation in applying Air Force guidance on A-E evaluation even among these groups. The difference between the averages of AFLC and ATC, for example, is 22 in the case of the past experience criterion. However, no AFLC bases considers that specific criterion to gauge experience. Rather, they consider other experience-related specific criteria.

The frequency of each criterion's use was also of interest in this study. Table 13 reports each criterion's frequency of use within each MAJCOM, and Table 14 presents their frequency by A-E selection region. Again, the rightmost column of both tables reflects the CONUS Air Force average computed from all 62 respondents. For example, 55 percent of ATC bases consider an A-E's technical qualifications, while only 27 percent of all the respondents consider that criterion. No AFLC or AFSC bases reported

Table 13

Percent Usage of Each Criterion
By Major Command

Criterion	Major Command					CONUS USAF
	AFLC	AFSC	ATC	MAC	SAC	TAC
General Experience	83	40	82	38	47	17
Specialized Exper.	17	60	36	75	42	75
Past Experience	0	80	45	25	47	67
General Capability	83	20	27	38	32	8
Availability of Key Personnel	17	60	64	50	32	83
Technical Qualif.	0	0	55	25	42	8
General Workload	83	20	27	38	53	42
Capacity to Do the Work in Time	17	80	73	63	32	83

Table 13 (continued)

Percent Usage of Each Criterion
By Major Command

Criterion	Major Command						CONUS USAF
	AFLC	AFSC	ATC	MAC	SAC	TAC	
Location of Firm	100	100	100	100	95	100	98
Small/Minority Bus.	100	80	100	100	89	100	95
Number of Prior DOD Awards	100	80	91	75	63	67	76
Dollar Value of Prior Awards	83	20	64	75	58	67	63
Cost Control Eff.	0	0	0	25	5	67	18
Innov. Design Cap.	0	0	0	38	0	67	18
Construction Insp. Capability	0	0	0	13	11	25	10
Organiz. Adequacy	0	0	0	0	37	0	11
CAD/CAM Capability	0	0	0	0	5	0	2
Toll-free Phone	0	0	0	0	5	0	2

Table 14

Percent Usage of Each Criterion
By A-E Selection Region

Criterion	A-E Selection Region					CONUS USAF
	1	2	3	4	5	
General Experience	25	42	67	67	33	48
Specialized Experience	63	58	42	33	67	52
Past Experience	50	58	42	20	60	45
General Capability	38	17	33	53	20	32
Availability of Key Personnel	38	67	42	33	67	50
Technical Qualifications	38	17	42	7	40	27
General Workload	50	33	42	60	40	45
Capacity to Do the Work in Time	63	83	42	40	53	55

Table 14 (continued)

Percent Usage of Each Criterion
By A-E Selection Region

Criterion	A-E Selection Region					CONUS USAF
	1	2	3	4	5	
Location of Firm	100	100	92	100	100	98
Small/Minority Business	88	92	92	100	100	95
Number of Prior DOD Awards	63	83	67	100	60	76
Dollar Value of Prior Awards	63	58	50	80	60	63
Cost Control Eff.	13	25	0	13	27	18
Innovative Design Cap.	25	33	0	13	27	18
Construction Inspection Capability	0	8	17	13	7	10
Organizational Adequacy	25	0	25	7	7	11
CAD/CAM Capability	0	0	8	0	0	2
Toll-free Phone	0	0	8	0	0	2

using that criterion. SAC is the only MAJCOM which uses all the reported criteria. On the other hand, AFLC, AFSC, and ATC bases use only criteria based in the seven categories in AFR 88-31. Regionally, no selection region is apparently far from the Air Force usage average indicated in the rightmost column of Table 14. However, as in the cases of Tables 11 and 12, some variation in the actual criteria used does appear to exist.

While differences between MAJCOMs and A-E selection regions are evident, the use of analysis of variance (ANOVA) and Bonferroni multiple comparison tests can detect if the differences noted are statistically significant. That is, are the apparent differences minor in nature and due to the inherent randomness of any data collection procedure, or are they significant enough to warrant further attention? ANOVA and Bonferroni multiple comparison tests were conducted on the means of the maximum possible points attainable for each criterion to investigate this question. The treatment groups of interest were the six MAJCOMs and the five A-E selection regions.

Table 15 lists the criteria for which significant differences existed in the means of the maximum possible points between MAJCOMs and geographic regions. The table also indicates which MAJCOMs and regions differ statistically for each criterion identified in the ANOVA and Bonferroni tests. For example, the 3.3 point difference between the means at ATC and TAC bases which use the

Table 15

Criteria With Significantly Different
Ratings Between MAJCOMs and Regions

Criterion	Differing Groups (alpha = 0.05)	Amount of Difference
=====		
MAJCOM Differences		Points
-----		-----
Subtotal of Experience Category	ATC - TAC	16.5
Small/Minority Business	ATC - SAC	3.3
	ATC - TAC	2.9
Total Possible Points at Base	AFLC - AFSC	46.8
	AFSC - ATC	42.6
Regional Differences		Points
-----		-----
General Experience	2 - 4	13.3
Dollar Value of Prior Awards	4 - 5	6.2
Innovative Design Capability	1 - 5	6.5
=====		

small/minority business criterion was found to be statistically significant. The chosen level of statistical significance of 0.05 allows the differences to be asserted with 95 percent confidence.

The reader should note that Tables 11 and 12 report point differences much greater than 3.3 which did not appear in Table 15 as statistically significant. This apparent paradox is due to ANOVA's and Bonferroni's sensitivity to the number of values which contribute to the means being tested. For example, the 3.3 point difference discussed

earlier was based on all of the 11 participating ATC bases and all of the 12 responding TAC bases. This was because all of the ATC and TAC bases used the small/minority business criterion under consideration by this example. In contrast, consider the example of the 22 point difference in the use of past experience between AFLC and ATC. ANOVA did not report that difference as significant because, as Table 13 indicated, only 45 percent (5) of ATC bases and no AFLC bases used that criterion. In this example, the absence of testable data prevented the statistical test from finding the 22 point difference significant at the 95 percent confidence level.

The one noteworthy trend in Table 15 is that ATC is involved in the three criteria in which there are differing MAJCOMs. In each case, ATC has the higher average maximum rating of the differing commands. In the particular case of the experience subtotal, ATC's average maximum rating is 39 whereas AFR 88-31 recommends that the maximum rating not exceed 30 points. ATC's average rating is 16 5 points higher than that of TAC, and 7 points higher than the next highest MAJCOM (SAC).

V. Summary and Recommendations

Overview

The specific objective of this study was to develop an A-E evaluation form based upon how Air Force installations located in the continental United States (CONUS) interpret the FAR and AFR 88-31.

This chapter aggregates the set of criteria which is most frequently used and most heavily weighted by BCEs comprising the sample. In addition, this chapter presents a brief summary of the study's major findings, and concludes with recommendations for further research of the A-E selection process.

Specific Objective

Table 16 presents an A-E evaluation form based on the criteria most frequently used and most heavily weighted by BCEs. It was assumed that a criterion's use and the maximum possible rating which could be achieved for the criterion is a reasonable measure of the importance attributed to the criterion by Air Force BCEs. The data in Table 9, summarizing these two characteristics of each criterion, were used to develop Table 16.

Two additional considerations affected the content of the aggregated scoresheet in Table 16. First, the A-E scoresheets received in response to the letter requesting the BCEs' input had varying levels of detail. For example, Base A indicated that their evaluation of an A-E's

capability included assessments of the availability of key personnel and the technical qualifications of the firm. In contrast, Base B's scoresheet indicated only that the A-E's capability is to be evaluated without any further guidance on the measures of capability. In such cases, the base's specific criteria were entered in a general criterion named for the category to which it applied. Similar differences in detail in the categories of experience and workload were encountered. Appendix D contains representative responses to the letters sent to all CONUS BCEs. To safeguard the anonymity of all respondents, any references to the source of Appendix D's examples have been omitted.

Second, the limits on a category of criteria imposed by AFR 88-31 were observed in deriving the maximum possible points for each criterion. Where more than one criterion appears within a category, the proper maximum possible points for each criterion was determined in proportion to its respective average reported in Table 9. For example, both specialized and past experience were considered in assessing an A-E's experience qualifications. Table 9 showed that 52 percent of all respondents considered specialized experience at an average rating of 22 points, while 45 percent used past experience at an average rating of 15 points. However, some bases used both criteria. Using these percentages and average ratings as weighting factors, aggregated ratings for these two criteria were calculated as 19 for specialized experience and 11 for past

experience, resulting in the 30-point subtotal for the experience category which is in compliance with AFR 88-31's guidance.

Table 16

Aggregated Scoresheet Based on Input
From 62 CONUS Bases

=====	
Criterion	Maximum Possible Points
=====	
Specialized Experience	19
Past Experience with Similar Work	11
Availability of Key Personnel	20
Technical Qualifications in the Necessary Disciplines	10
Capacity to Do the Work in Time	15
Location of Firm in Proximity of the Jobsite	10
Small/Minority Business	13
Number of Prior DOD Contracts Awarded	8
Dollar Value of Prior DOD Awards	20
Cost Control Effectiveness	10
Innovative Design Capability as Evidenced by Professional Awards	10
Total Points Possible	146
=====	

Summary of Findings

This study investigated the manner by which Air Force BCEs select A-Es for the procurement of design services. After providing background information and outlining the steps taken in the research process, the study presented its major findings in answering the three investigative questions posed in Chapter I.

Table 9 reported the set of specific criteria which BCEs use to evaluate an A-E's qualifications. In general, the criteria are common to most bases and are applied in a consistent manner. Additionally, Table 10 showed that the criteria used are generally consistent with AFR 88-31 guidelines. Criteria used which do not fit any of the AFR 88-31 categories are cost control effectiveness, innovative design capability, construction inspection capability, organizational adequacy, computer-aided design or manufacturing capability, and toll-free telephone access. Finally, Table 15 presented the differences in application of AFR 88-31 guidelines which exist between MAJCOMs and the geographically-defined A-E selection regions.

The study concluded with an A-E selection scoresheet aggregated from the scoresheets of 62 BCEs to serve as a cumulative version of the various methods used by CONUS BCEs to apply the AFR 88-31 guidelines. The aggregated evaluation tool appeared in Table 16.

Recommendations for Further Research

In conducting the necessary research for this thesis, the writer became aware of several points that future researchers of the A-E selection process should consider.

First, it was obvious in the study's initial stages of development that little research had been accomplished on the Air Force use of A-E design services. The selection process is only one of many topics related to this type of procurement, and future researchers should consider theses in this area. Suggested topics include the origin of the categories of criteria listed in AFR 88-31. Why were those categories considered appropriate?

Second, one limitation of this study was that it applied only to CONUS Air Force installations. Consequently, the aggregated scoresheet cannot be considered valid for overseas installations where other selection criteria may be more appropriate. Future researchers should investigate the criteria necessary to consider the uniqueness of A-E qualifications at Alaskan, European, or ~~Far Eastern bases.~~

Third, one recognized limitation of this research was that it involved only A-E selections made by Air Force units. Future research should study the similarities and differences between Air Force procedures and those of the Army and Navy.

Fourth, the writer recommends that future research assess the selection process from the A-E perspective. This

study determined the criteria that the Air Force considers important. It is possible that the private sector can contribute much to validate or modify the current procedure by responding to a survey investigating the criteria they believe best ensure a fair and equitable selection of a qualified firm.

Fifth, since all bases in the sample did not report that they use all of the seven AFR 38-31 categories of criteria, a study should examine the reasons for not using some of the categories. Are there special circumstances at selected bases which render some categories inappropriate for a fair and competitive A-E selection?

Finally, this research found a degree of variance in the A-E selection process. Follow-on researchers should investigate if that condition is in the best interests of the Air Force. While a standardized procedure would promote a perception of increased fairness, the uniqueness of each design project and each Air Force base may mitigate the possibility of one scoresheet for all selection boards.

Appendix A: Lists of Solicited Bases and Respondents

The following is a list of the 81 bases that were mailed the letter appearing in Appendix B, and represents a census of active-duty CONUS Air Force bases.

Altus AFB, Oklahoma
Andrews AFB, Maryland
Barksdale AFB, Louisiana
Beale AFB, California
Bergstrom AFB, Texas
Blytheville AFB, Arkansas
Bolling AFB, District of Columbia
Brooks AFB, Texas
Cannon AFB, New Mexico
Carswell AFB, Texas
Castle AFB, California
Chanute AFB, Illinois
Charleston AFB, South Carolina
Columbus AFB, Mississippi
Davis-Monthan AFB, Arizona
Dover AFB, Delaware
Dyess AFB, Texas
Edwards AFB, California
Eglin AFB, Florida
Ellsworth AFB, South Dakota
England AFB, Louisiana
F.E. Warren AFB, Wyoming

Fairchild AFB, Washington
George AFB, California
Goodfellow AFB, Texas
Grand Forks AFB, North Dakota
Griffiss AFB, New York
Grissom AFB, Indiana
Hanscom AFB, Massachusetts
Hill AFB, Utah
Holloman AFB, New Mexico
Homestead AFB, Florida
Hurlburt AFB, Florida
K.I. Sawyer AFB, Michigan
Keesler AFB, Mississippi
Kelly AFB, Texas
Kirtland AFB, New Mexico
Lackland AFB, Texas
Langley AFB, Virginia
Laughlin AFB, Texas
Little Rock AFB, Arkansas
Loring AFB, Maine
Lowry AFB, Colorado
Luke AFB, Arizona
MacDill AFB, Florida
Malmstrom AFB, Montana
March AFB, California
Mather AFB, California
Maxwell AFB, Alabama

McChord AFB, Washington
McClellan AFB, California
McConnell AFB, Kansas
McGuire AFB, New Jersey
Minot AFB, North Dakota
Moody AFB, Georgia
Mountain Home AFB, Idaho
Myrtle Beach AFB, South Carolina
Nellis AFB, Nevada
Norton AFB, California
Offutt AFB, Nebraska
Patrick AFB, Florida
Pease AFB, New Hampshire
Peterson AFB, Colorado
Plattsburgh AFB, New York
Pope AFB, North Carolina
Randolph AFB, Texas
Reese AFB, Texas
Scott AFB, Illinois
Seymour-Johnson AFB, North Carolina
Shaw AFB, South Carolina
Sheppard AFB, Texas
Tinker AFB, Oklahoma
Travis AFB, California
Tyndall AFB, Florida
Vance AFB, Oklahoma
Vandenberg AFB, California

Warner-Robins AFB, Georgia
Whiteman AFB, Missouri
Williams AFB, Arizona
Wright-Patterson AFB, Ohio
Wurtsmith AFB, Michigan

The following is a list of the 62 bases that responded to the letters in Appendix B, and represents a 77 percent response rate.

Andrews AFB, Maryland
Bergstrom AFB, Texas
Blytheville AFB, Arkansas
Brooks AFB, Texas
Carswell AFB, Texas
Castle AFB, California
Chanute AFB, Illinois
Columbus AFB, Mississippi
Davis-Monthan AFB, Arizona
Dyess AFB, Texas
Edwards AFB, California
Eglin AFB, Florida
Ellsworth AFB, South Dakota
England AFB, Louisiana
F.E. Warren AFB, Wyoming
Fairchild AFB, Washington
George AFB, California
Grissom AFB, Indiana

Hanscom AFB, Massachusetts
Hill AFB, Utah
Holloman AFB, New Mexico
Homestead AFB, Florida
Hurlburt AFB, Florida
K.I. Sawyer AFB, Michigan
Kelly AFB, Texas
Keesler AFB, Mississippi
Kirtland AFB, New Mexico
Lackland AFB, Texas
Langley AFB, Virginia
Loring AFB, Maine
Lowry AFB, Colorado
Luke AFB, Arizona
Malmstrom AFB, Montana
Mather AFB, California
Maxwell AFB, Alabama
McChord AFB, Washington
McClellan AFB, California
McConnell AFB, Kansas
McGuire AFB, New Jersey
Minot AFB, North Dakota
Myrtle Beach AFB, South Carolina
Nellis AFB, Nevada
Offutt AFB, Nebraska
Patrick AFB, Florida
Pease AFB, New Hampshire

Plattsburgh AFB, New York
Pope AFB, North Carolina
Randolph AFB, Texas
Reese AFB, Texas
Scott AFB, Illinois
Seymour-Johnson AFB, North Carolina
Shaw AFB, South Carolina
Sheppard AFB, Texas
Tinker AFB, Oklahoma
Travis AFB, California
Vance AFB, Oklahoma
Vandenberg AFB, California
Warner-Robins AFB, Georgia
Whiteman AFB, Missouri
Wright-Patterson AFB, Ohio
Wurtsmith AFB, Michigan

Appendix B: Letters to CONUS BCEs

FROM: AFIT/LSG

30 Jan 87

SUBJECT: Research of Architect-Engineer (A-E)
Selection Criteria

TO: CES/CC

1. I am conducting thesis research at the Air Force Institute of Technology. I solicit your generous cooperation to contribute the data necessary to the subject research. In particular, I am requesting that you forward one unused copy of the evaluation form, or scoresheet, used by preselection boards at your unit to select A-Es for the design of construction project. In addition, please forward a copy of any local policies affecting A-E selections which are in effect at your base.

2. The characteristics of interest on the evaluation form are the specific criteria scored by your unit and the numeric range within which each specific criterion's score may fall. These data will be used to identify trends within and across major commands, geographic regions, and the Air Force as a whole. As a result of this research, I hope to consolidate these forms into a product of use to all commands.

3. Your invaluable and timely support would be greatly appreciated. Your organization will have complete anonymity throughout the thesis process, including the final report. Upon completion, the results and recommendations of this research will be available upon request to AFIT.

4. For more information concerning my request, please call me at AUTOVON 785-5435. Please forward your unit's input via official distribution to:

1st Lt Mark S. Tissi
AFIT/LSG
WPAFB OH 45433

MARK S. TISSI, 1st Lt, USAF
Graduate Student in Engineering Management
Air Force Institute of Technology

FROM: AFIT/LSG

2 Mar 87

SUBJECT: Research of A-E Selection Criteria
(Ref. my 30 Jan 87 letter)

TO: CES/CC

1. This letter is to remind you of my request in the referenced letter. I asked that you forward an unused copy of the evaluation form, or scoresheet, your unit uses to select A-E's for the design of construction projects. These forms will be used in my research to identify trends within and across major commands and the Air Force. I also hope to develop a consolidated product from among the inputs of all CONUS bases.

2. Please forward your unit's contribution to my research promptly as my deadline for data analysis is approaching. I understand your own press with deadlines, but I would greatly appreciate your participation in my study.

3. If you have already sent your evaluation form, thank you for your support. If not, your input should be sent to:

1st Lt Mark S. Tissi
AFIT/LSG
WPAFB OH 45433

4. Your organization's input will be kept in strictest confidence throughout the research effort. Questions concerning this request can be answered by calling me at AUTOVON 785-5435.

MARK S. TISSI, 1st Lt, USAF
Graduate Student in Engineering Management
Air Force Institute of Technology

Appendix C: Categorization of Original Data

Data categorization began with the collection of the 62 responses to the letters appearing in Appendix B. These responses were in the form of A-E evaluation scoresheets such as those shown in Appendix D. Each criterion, and a coded symbol of the base which used it, were placed in one of AFR 88-31's categories of criteria (experience, capability, workload, location, small/minority business, number of prior DOD awards, and dollar value of prior awards), or they were placed in a category for criteria not fitting any of the seven in the regulation.

A database was then created which contained each base's criteria and the maximum possible rating for each criterion. Spreadsheets were then created from the information in the database and are included in this appendix.

Each criterion's operational definition is listed below to present the rationale used to place a criterion in a particular category. The column labelled "CODE" contains the symbol for the base whose criteria is shown in the row. The remainder of the columns have uppercase alphabetic labels which are keyed to the operational definitions below.

- A. General Experience - the listed criterion was no more specific than "Experience".
- B. Specialized Experience - experience with Air Force projects similar to that to be awarded.
- C. Past Experience - quality of any previous designs, especially those done for the Air Force.

- D. Subtotal of Experience Category - sum of the maximum ratings available at the base.
- E. General Capability - the listed criterion was no more specific than "Capability".
- F. Availability of Key Personnel - the employment of a complete staff of architects and engineers of each required discipline.
- G. Technical Qualifications - professional registration and licensing of architects and engineers.
- H. Subtotal of Capability Category - sum of the maximum ratings available at the base.
- I. General Workload - the listed criterion was no more specific than "Workload".
- J. Capacity to Do Work in Required Time - ability of the firm to meet deadlines with available personnel.
- K. Subtotal of Workload Category - sum of the maximum ratings available at the base.
- L. Location of Firm - proximity of assigned designers to the site of the future construction.
- M. Small/Minority Business - legal qualification as a socially and economically disadvantaged small business firm.
- N. Number of Prior DOD Awards - DOD projects previously awarded to the A-E within the past three fiscal years. Maximum points are assigned to firms with no prior awards.
- O. Dollar Value of Prior Awards - dollar value of awards defined in N. Maximum points are assigned to firms with no prior awards.
- P. Cost Control Effectiveness - ability to deliver required work within the budgeted amount.
- Q. Innovative Design Capability - evidenced by the number of design competitions won by the firm's recent work.

- R. Construction Inspection Capability - the availability of qualified inspectors to oversee construction of the firm's design.
- S. Organizational Adequacy - general assessment of the firm's organizational structure.
- T. Computer-aided Design/Manufacturing - the access of the firm to these technological advances in facility design.
- U. Toll-free Phone - the firm can be contacted by phone from the BCE office without a toll charge.

Summary statistics computed in the spreadsheets include TOTAL POSSIBLE, the sum of the maximum possible points available from all criteria used by the base; AVG, the average of the maximum possible points among bases who use the criterion represented by the column; and PCT USE, the percentage of bases using the criterion represented by the column. The absence of a percentage indicates a 100 percent usage rate.

MAXIMUM POSSIBLE RATINGS PER CRITERION
(LISTED BY BASE)

CODE	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	TOTAL POSSIBLE
1		10	10	20		10		10		10	10	10	10	10		10	10	10				100
2	30			30	30			30	20		20	10	12	5	20							127
3	20		25	45		15	25	40		5	5	10	15	5								129
4		30		30			30	30	20		20	10	12	5	20							127
5	30			30	30			30	20		20	10	12	10	20							132
6		30		30	30			30		20	20	10	10	5	5							119
7		65	10	75				0		20	20							5				100
8		15	15	30		15	15	30			0	15	10						15			100
9		40	15	55		10		10		10	10	15	10									129
10	30		10	40				0		10	10	10	3	5					10			33
11	30			30		30		30			0	5	10	5	20							100
12	30			30	30			30	20		20	10	11	20								121
13			25	25			10	10			0	5							10			50
14			10	10		65	15	80			0	15	10						10	5	10	140
15	15	20	25	60		15	20	35		5	5	10	15	10								105
16	30			30	20			20	10		10	10	10	10	20							119
17	30			30	20			20	10		10	10	11	10	20							119
18		30		30	30			30	20		20	10	12	5	20							127
19		11	9	20		11		11		11	11	9	10		9	9	11					90
20	10		15	25		14	10	27		20	20	19	15	3								115
21		10	9	19		7		7		8	3	5	3	5								50
22		20	20	40		10	15	25		5	5	10	15		10							105
23	30			30	30			30	20		20	10	12	10	20							132
24		10	10	20		10	15	25			0	15	10		10				10			90
25	30			30	30			30	20		20	10	12	5	20							127
26	30			30	30			30	20		20	10	12	10	20							132
27	30			30		30		30		20	20	10	11	5	20							125
28		30		30			20	20		10	10	10	11	10	20							111
29		30		30		25		25		20	20	5	15	5	20	10	10	10				130
30		10	10	20		10		10		10	10	10	10		10	10	10	10				100
31			30	30		20		20		10	10	10	10	5	20							105
32		10	10	20		10		10		10	10	10	10	10								70
33		15	15	30		10	10	20	5		5	5	10		5	15	15					105
34	30			30		30		30		20	20	10	12	10	20							132
35		20		20		15		15	10	15	25	4	5		5	10						34
36	30			30	30			30	20		20	10	12	5	20							127
37		30		30		30		30	20		20	10	12	5	20							127
38		40	20	60			15	15		25	25	15	12	5								132
39	10		25	35			10	10	5		5	6	8						10			75
40	15	20	25	60		15	20	35		5	5	10	15	10								135
41		25	5	30		20	8	28		10	10	10	12		20	5	5					120
42	30			30	30			30	20		20	10	12	5	20							127
43	20			20	30			30	20		20	10	12	8	20							120
44	30			30	30			30	20		20	10	12	10	20				10			142
45	10		10	20				0		10	10	10										40
46	10	10		20			10	10		10	10	10	10	10								70
47	30			30	30			30	20		20	10	12	10	20							132
48		10		10		10		10	10	10	20	10	10	10		10	10					90
49	10		10	20			0	10	10	20	10	10			10	10	10					90
50	25			25	20			20	10		10	10	10	5	20							100
51	30			30	30			30	20		20	10	12	10	20							132
52		25		25		20		20		10	10	10	9	5	20							99
53		10	10	20		10		10		10	10	10	10	10		10	10					95
54		30		30		30		30		20	20	10	12	10	20							132
55		20		20		10		10	5	20	25	10	12	10	20	10	10					127
56		15	25	40			15	15	15	10	25	15	10	10					15			130
57	25			25	20			20	10		10	10	9	5	20							100
58	30			30	30			30	20		20	10	10	10	20							129
59		10	10	20		10		10		10	10	10	7	10				10				95
60		30		30		30		30		20	20	10	10	10	20			10				140
61		30	10	40		20		20		5	5	25	16	5								111
62	25			25	25			25	10		20	5	10	5	20							119
AVG	25	22	15	30	28	18	16	24	16	12	15	10	11	8	18	10	10	9	11	5	10	110
PCT																						
USE	48%	52%	45%		32%	50%	27%		45%	55%		98%	95%	76%	63%	18	18	10	11	27	27	

MAXIMUM POSSIBLE RATINGS PER CRITERION
(LISTED BY MAJOR COMMAND)

CODE	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	TOTAL POSSIBLE
<hr/>																						
AFSC																						AFSC
12	30			30	30			30	20		20	10	11	20								121
25	30			30	30			30	20		20	10	12	10	20							132
36	30			30	30			30	20		20	10	12	5	20							127
43	20			20	30			30	20		20	10	12	8	20							130
54		30		30		30		30		20	20	10	12	10	20							132
59	30			30	30			30	20		20	10	10	10	20							130
AVG	28	30	0	28	30	30	0	30	20	20	20	10	12	11	20	0	0	0	0	0	0	127
PCT																						
USE	93%	17%	0%		83%	17%	0%		83%	17%		100	100	100	93%	0%	0%	0%	0%	0%	0%	
<hr/>																						
AFSC																						AFSC
21		10	9	19		7		7		3	3	6	3	5								480
25	30			30	30			30	20		20	10	12	5	20							127
32		10	10	20		10		10		10	10	10	10	10								70
45	10		10	20				0		10	10	10										40
51		30	10	40		20		20		5	5	25	15	5								111
AVG	20	17	9.8	26	30	12	0	13	20	9.3	11	12	12	8.3	20	0	0	0	0	0	0	90.2
PCT																						
USE	40%	30%	30%		20%	50%	0%		20%	30%		100	30%	30%	20%	0%	0%	0%	0%	0%	0%	
<hr/>																						
ATC																						ATC
2	30			30	30			30	20		20	10	12	5	20							127
3	20		25	45		15	25	40		5	5	10	15	5								120
15	15	20	25	60		15	20	35		5	5	10	15	10								105
16	30			30	20			20	10		10	10	10	10	20							110
20	10		16	26		14	13	27		20	20	19	15	8								115
22		20	20	40		10	15	25		5	5	10	15		10							105
27	30			30		30		30		20	20	10	11	5	20							125
28		30		30			20	20		10	10	10	11	10	20							111
34	30			30		30		30		20	20	10	12	10	20							132
40	15	20	25	60		15	20	35		5	5	10	15	10								105
42	30			30	30			30	20		20	10	12	5	20							127
AVG	25	23	22	37	27	18	19	29	17	11	13	11	13	7.9	19	0	0	0	0	0	0	123.1
PCT																						
USE	92%	36%	45%		27%	64%	55%		27%	73%		100	100	91%	64%	0%	0%	0%	0%	0%	0%	
<hr/>																						
MAC																						MAC
6		30		30	30			30		20	20	10	10	5	5							110
9		40	15	55		10		10		10	10	15	10									100
17	30			30	28			28	10		10	10	11	10	20							119
29		30		30		25		25		20	20	5	15	5	20	10	10	10				150
33		15	15	30		10	10	20	5		5	5	10		5	15	15					105
46	10	10		20			10	10		10	10	10	10	10								70
60		30		30		30		30		20	20	10	10	10	20		10					140
62	25			25	25			25	20		20	5	10	5	20							110
AVG	22	26	15	31	28	19	10	22	12	16	14	9.9	11	7.5	15	13	12	10	0	0	0	113
PCT																						
USE	68%	75%	35%		38%	50%	25%		38%	53%		100	100	75%	75%	25	38	13	0%	0%	0%	

MAXIMUM POSSIBLE RATINGS PER CRITERION
LISTED BY MAJOR COMMAND:

REVISED 17 AUGUST 2000																						TOTAL
CODE	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	POSSIBLE
SAC																						SAC
4		30		30			30	30	20		20	10	12	5	20							127
7		65	10	75				0		20	20							5				100
8		15	15	30		15	15	10			0	15	10						15			100
10	30		10	40				0		10	10	10	5	5					10			81
11	30			30		20		20			0	5	10	5	20							100
13			25	25			10	10			0	5							10			57
14			10	10		35	15	30			0	15	10						10	5	10	140
20	30			30	30			30	20		20	10	12	10	20							172
24		10	10	20		10	15	25			0	15	10		10				10			90
26		20		20		15		15	10	15	25	4	3		5	10						94
28		40	20	30			15	15		25	25	15	12	5								131
33	10		25	35			10	10	5		5	5	3						10			73
44	30			10	30			30	20		20	10	12	10	10			10				140
47	30			30	30			30	20		20	10	12	10	20							172
50	25			25	20			20	10		20	10	10	5	20							170
51	30			30	30			30	20		20	10	12	10	20							182
52		25		25		20		20		10	10	10	5	3	20							95
53		15	25	40			15	15	15	10	25	15	10	10					15			130
57	25			25	20			20	10		10	10	5	5	20							130
AVG	27	28	17	32	27	25	15	25	15	15	17	10	10	7.1	13	10	9	8	11	5	10	107.3
PGT																						
USE	47%	42%	47%		33%	33%	42%		53%	33%		45%	39%	63%	58%	51%	40%	11	37	37	5%	
SAC																						SAC
1		10	10	20		10		10		10	10	10	10	10		10	10	10				120
5	30			30	30			30	20		20	10	12	10	20							172
19		11	9	20		11		11		11	11	9	10		9	9	11					90
20		10	10	20		10		10		10	10	10	10		10	10	10	10				100
21			30	30		20		20		10	10	10	10	5	20							105
37		30		30		30		30	20		10	10	12	5	20							127
41		25	5	30		20	5	23		10	10	10	12		20	5	5					120
43		10		10		10		10	10	10	20	10	10	10		10	10					90
49	10		10	20				9	10	10	20	10	10		10	10	10					90
52		10	10	20		10		10		10	10	10	10	10		10		10				90
55		20		20		10		10	5	20	25	10	12	10	20	10	10					127
59		10	10	20		10		10		10	10	10	7	10			10					77
AVG	20	15	12	22	30	14	8	15	10	11	15	9.9	10	8.3	15	9	10	10	9	9	9	104.0
PGT																						
USE	17%	75%	67%		3%	33%	3%		42%	33%		100	100	57%	57%	57	57	25	0%	0%	0%	

MAXIMUM POSSIBLE RATINGS PER CRITERION
(LISTED BY DDD 4-E REGION)

CODE	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	TOTAL POSSIBLE
REGION 1																						REGION 1
8		30		30	30			20		20	20	10	10	5	5							110
10			25	25			10	10			0	5						10				50
21		10	9	19		7		7		8	8	5	8	5								50
25	30			30	30			30	20		20	10	12	10	20							100
38		20		20		15		15	10	15	25	4	5		5		10					34
41		25	5	30		20	8	28		10	10	10	12		20	5	5					120
55		15	25	40			15	15	15	10	25	15	10	10				15				100
62	25			25	25			25	20		20	5	10	5	20							110
AVG	28	20	18	27	28	14	11	20	18	10	18	9.1	9.5	7	14	5	8	10	10	10	99.5	
PCT																						
USE	25%	50%	50%		58%	38%	58%		50%	50%		100%	88%	50%	50%	10	25	10	25	10	10	
REGION 2																						REGION 2
1		10	10	20		10		10		10	10	10	10	10		10	10	10				100
15	15	20	25	30		15	20	25		5	5	10	15	10								105
17	30			30	28			28	10		10	10	11	10	20							119
18		30		30	30			30	20		20	10	12	5	20							127
20	10		15	25		14	10	27		20	20	19	15	8								115
31			30	30		20		20		10	10	10	10	5	20							115
45	10		10	20				0		10	10	10										40
49	10		10	20				0	10	10	20	10	10		10	10	10					90
54		30		30		30		30		20	20	10	12	10	20							112
55		20		20		10		10	5	20	25	10	12	10	20	10	10					127
60		30		30		30		30		20	20	10	10	10	20		10					140
61		30	10	40		20		20		5	5	25	15	5								111
AVG	15	24	18	30	29	19	17	24	11	10	15	12	12	8.3	19	10	10	10	10	10	111.3	
PCT																						
USE	40%	58%	58%		17%	57%	17%	80%	33%	83%		100%	92%	83%	58%	25	30	8%	0%	0%	0%	
REGION 3																						REGION 3
7		65	10	75				0		20	20					5						100
8		15	15	30		15	15	30			0	15	10				15					100
14			10	10		65	15	80			0	15	10				10	5	10			140
27	30			30		30		30		20	20	10	11	5	20							125
39	10		25	35			10	10	5		5	5	8				10					75
40	15	20	25	30		15	20	35		5	5	10	15	10								105
44	30			30	30			30	20		20	10	12	10	20		10					142
46	10	10		20			10	10		10	10	10	10	10								70
47	30			30	30			30	20		20	10	12	10	20							102
51	30			30	30			30	20		20	10	12	10	20							102
52		25		25		20		20		10	10	10	9	5	20							88
57	25			25	20			20	10		10	10	9	5	20							100
AVG	33	27	17	34	28	29	14	50	15	10	14	11	11	9.1	20	0	0	8	12	5	10	112.5
PCT																						
USE	67%	42%	42%		33%	42%	42%	92%	42%	42%	83%	92%	92%	87%	50%	20	0%	17	25	30	3%	

MAXIMUM POSSIBLE RATINGS PER CRITERION
LISTED BY DOD 4-E REGION

LATEST OF 2024 REGION																					TOTAL	
CODE	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U POSSIBLE	
REGION 4																					REGION 4	
2	30			30	30			30	20		20	10	12	5	20						127	
10	30		10	40				0		10	10	10	8	5				10			87	
18	30			30	20			20	10		10	10	10	10	20						110	
23	30			30	30			30	20		20	10	12	10	20						132	
25	30			30	30			30	20		20	10	12	5	20						127	
28		30		30			20	20		10	10	10	11	10	20						111	
29		30		30		25		25		20	20	5	15	5	20	10	10				115	
34	30			30		30		30		20	20	10	12	10	20						132	
36	30			30	30			30	20		20	10	12	5	20						127	
37		30		30		30		30	20		20	10	12	5	20						127	
42	30			30	30			30	20		20	10	12	5	20						127	
43	20			20	30			30	20		20	10	12	5	20						127	
50	25			25	20			20	10		10	10	10	5	20						120	
53		10	10	20		10		10		10	10	10	10	10		10	10				110	
59		10	10	20		10		10		10	10	10	7	10			10				110	
AVG	29	22	10	29	28	21	20	25	18	13	15	9.7	11	7.2	20	13	13	13	13	10	118	
PCT																						
USE	67%	33%	20%		53%	33%	7%	93%	50%	40%		100	100	100	80%	13	13	13	7%	0%	0%	
REGION 5																					REGION 5	
7	20		15	45		15	25	40		5	5	10	15	5							121	
8		30		30			30	30	20		20	10	12	5	20						127	
9	30			30	30			30	20		20	10	12	10	20						132	
11		40	15	55		10		10		10	10	15	10								130	
12	30			30		30		30		0	5	10	5	20							109	
19		30		30	30			30	20		20	10	11	20							121	
19		11	9	20		11		11		11	11	9	10		9	9	11				90	
22		20	20	40		10	15	25		5	5	10	15		10						105	
24		10	10	20		10	15	25			0	15	10		10			10			90	
30		10	10	20		10		10		10	10	10	10		10	10	10	10			100	
32		10	10	20		10		10		10	10	10	10	10		10					100	
33		15	15	30		10	10	20	5		5	5	10		5	15	15				105	
38		40	20	60			15	15		25	25	15	12	5							112	
48		10		10		10		10	10	10	20	10	10	10		10	10				90	
58	30			30	30			30	20		20	10	10	10	20						130	
AVG	28	20	15	31	30	17	18	22	16	11	14	10	11	9.9	14	11	12	10	10	0	107.5	
PCT																						
USE	33%	67%	60%		20%	67%	40%		40%	53%	87%	100	100	80%	80%	27	27	7%	7%	0%	0%	

SUMMARY OF MAJCOM-WIDE RATINGS																						TOTAL
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	POSSIBLE
AFSC	29	30	0	28	30	30	0	30	20	20	20	10	12	11	20	0	0	0	0	0	0	127
	83%	17%	0%		83%	17%	0%		83%	17%		100	100	100	83%	0%	0%	0%	0%	0%	0%	
AFSC	20	17	9.8	26	30	12	0	13	20	3.3	11	12	12	5.3	20	0	0	0	0	0	0	80.2
	40%	50%	80%		20%	50%	0%		20%	80%		100	80%	80%	20%	0%	0%	0%	0%	0%	0%	
ATC	33	33	32	37	37	19	19	29	17	11	13	11	13	7.3	19	0	0	0	0	0	0	122.1
	82%	86%	45%		87%	64%	55%		87%	73%		100	100	91%	64%	0%	0%	0%	0%	0%	0%	
MAC	22	25	15	31	29	19	10	22	12	16	14	8.8	11	7.5	15	13	12	10	0	0	0	113
	58%	75%	25%		73%	50%	25%		58%	63%		100	100	75%	75%	25	33	13	0%	0%	0%	
SAC	27	28	17	32	27	26	16	26	15	15	17	10	10	7.1	18	10	0	8	11	5	10	107.3
	47%	42%	47%		52%	52%	42%		53%	52%		95%	89%	63%	58%	5%	0%	11	37	5%	5%	
TAC	20	15	12	23	30	14	8	16	13	11	15	9.9	10	8.8	16	9	10	10	0	0	0	104.0
	17%	75%	67%		8%	83%	9%		42%	83%		100	100	67%	67%	67	67	25	0%	0%	0%	
AIR FORCE - WIDE	25	22	15	30	28	18	16	24	16	12	15	10	11	8	18	10	10	9	11	5	10	119
	48%	52%	45%		52%	50%	27%		45%	55%		98%	95%	76%	63%	18	18	10	11	2%	2%	

SUMMARY OF DOD A-E REGION - WIDE RATINGS																					TOTAL	
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	POSSIBLE
REGION 1	28	20	16	27	28	14	11	20	16	13	16	8.1	7.5	7	14	5	8	0	13	0	0	98.6
	75%	63%	50%		78%	59%	38%		50%	63%		100	88%	63%	63%	13	25	0%	25	0%	0%	
REGION 2	15	24	16	30	29	19	17	24	11	13	15	12	12	8.3	19	10	10	10	0	0	0	111.3
	42%	58%	58%		17%	67%	17%	83%	53%	83%		100	92%	83%	58%	25	33	8%	0%	0%	0%	
REGION 3	23	27	17	34	23	29	14	30	15	13	14	11	11	8.1	20	0	0	8	12	5	10	112.5
	67%	42%	42%		55%	42%	42%	92%	42%	42%	83%	92%	92%	67%	50%	0%	0%	17	25	5%	8%	
REGION 4	29	22	10	28	23	21	20	25	18	13	16	9.7	11	7.2	20	19	10	10	10	0	0	116
	67%	53%	20%		53%	53%	7%	92%	60%	40%		100	100	100	60%	13	13	13	7%	0%	0%	
REGION 5	23	20	15	31	30	13	18	22	15	11	14	10	11	8.9	14	11	12	10	10	0	0	107.5
	53%	67%	60%		20%	67%	40%		40%	53%	87%	100	100	80%	80%	27	27	7%	7%	0%	0%	
AIR FORCE - WIDE	25	22	15	30	28	18	16	24	16	12	15	10	11	8	18	10	10	9	11	5	10	119
	48%	52%	45%		52%	50%	27%		45%	55%		98%	95%	76%	63%	18	18	10	11	2%	2%	

Appendix D: Representative Responses of BCEs

Sixty-two Base Civil Engineers, representing 77 percent of those solicited, responded to the letters appearing in Appendix B. All of the responses were A-E evaluation scoresheets developed by the base for preselection and selection boards. Three responses, deliberately chosen to demonstrate the varying degrees of detail contained in all the responses, are shown in this appendix. To safeguard the anonymity of all respondents, any references to the source of the three responses shown have been omitted.

CRITERIA FOR A-E SELECTION

1. Specialized Experience - 10 Points

Rating Consideration

- a. Satisfactory design experience on similar Air Force project(s) in past 4 years.
- b. Satisfactory design experience on similar Army or Navy project(s) in past 4 years.
- c. Satisfactory design experience on similar work in private sector.
- d. No experience.

Rationale: Air Force facilities have unique design requirements and experience in designing similar facilities is highly desirable.

2. Availability of Experienced Key Personnel - 10 Points

Rating Consideration

- a. Firm permanently employs a complete staff of Architects, Structural, Mechanical, Civil, Electrical Engineers and Interior Designers and required no consultants. (Joint venture with same firm.)
- b. Requires a Consultant in one discipline.
- c. Requires Consultants in two disciplines.
- d. Firm uses Consultants in three or more disciplines. New joint ventures.

Rationale: The more Consultants an A-E has to use, the more difficult it is to coordinate the design and control the design effort to meet the short design period requirements. Joint ventures made to involve minority groups or location points created difficult communications since neither have worked together. True joint ventures which have worked together over a long period of time have worked out these problems.

3. Capacity of the Firm to Accomplish the Work in the Required time - 10 Points

Rating Consideration

- a. Firm indicates their workload will permit devoting the time and professional talent required to complete the design on time.
- b. No response on this factor.

Rationale: Self-explanatory.

4. Past Experience of the Firm With Similar Level Work - 10 Points

Rating Consideration

- a. Satisfactory design experience at similar level of work for the Air Force in the last 4 years.
- b. Satisfactory design experience at similar level of work for the Army and Navy in the last 4 years.
- c. Satisfactory design experience at similar level of work for private industry in the last 4 years.
- d. No experience.

Rationale: If the A-E has performed successfully at the same level in the past 4 years, maximum points can be given.

5. Location of the Firm - 10 Points

Rating Consideration

- a. Within the immediate telephone area.
- b. Outside a., but within state.
- c. Outside b., but within the region, i.e., Southwest, Northeast, etc.
- d. East/or West of the Mississippi River.

NOTE: Consider telephone access for out of area companies (Autovon access through a nearby Military Installation).

Rationale: Travel to the job site during design and construction is facilitated if the A-E is close. Location of the firm in joint ventures should be considered as the location of the firm scheduled to do the major portions of the design effort. Paragraph 2.a.(U) of reference 1.a indicates "A-E firms shall normally be selected from the region or area in which the project is to be accomplished".

6. Volume of Recent Government Projects - 10 Points

Rating Consideration (Form 254-Item 3)

- a. No Federal projects in last fiscal year.
- b. \$100,000 or less of design fees for Federal projects in last FY.
- c. \$100,000 to \$250,000 of design fees for Federal projects in last FY.

d. \$250,000 to \$500,000 of design fees for Federal projects in last FY.

e. Over \$500,000 of design fees for Federal projects in the last FY.

Rationale: Distribution of Federal design contracts among many A-Es.

7. B(a) Small Disadvantaged Business Involvement (Form 254, Item 4a) - 10 Points

Rating Consideration

a. If Form 254, Item 4 is "yes"

b. If Form 254, Item 4 is "no" or not marked.

Rationale: Disadvantaged involvement must count at least the average of all the rating factors. We have 9 rating factors and a total of 90 points. Disadvantaged firm is therefore awarded $90/9 = 10$ points.

8. Cost Control Effectiveness - 10 Points

Rating Consideration

a. Firm has demonstrated ability to design within the available funds on two or more projects within past 12 months.

b. Firm has demonstrated ability to design within the available funds on one project within past 12 months.

c. Ability to design within available funds has not been demonstrated.

Rationale: Recent demonstrated cost control effectiveness on several projects is required, to insure that the firm is capable in this area.

9. Full-Time Construction Inspection Capability - 10 Points

Rating Consideration

a. Firm has in-house construction inspection capability to be used on this project.

b. Firm would hire a consultant that had been previously hired for construction inspection.

c. Firm would hire a consultant that they had not used before.

d. Construction inspection not addressed.

Rationale: Best control of inspection responsibilities results when the capability is in-house. The use of a previously-hired consultant for this purpose is considered less desirable.

10. Innovative Design Capability - 10 Points

Rating Consideration

a. Firm has won AF, TAC, or other recognized Professional Design group/design awards within last two years.

b. Firm has not won awards, but their submittal indicates successful innovative designs.

c. Neither of the above.

Rationale: The Air Force insists on design excellence - awards are generally one of the best indicators of the firm's innovative capability.

A&E SELECTION BOARD RATING

PRESELECTION

PRIORITY RATING	PROJECT TITLE:			
	A&E FIRM			
	BOARD MEMBER	DATE: _____	RANK VALUE RANGE	ASSIGNED POINTS
1	SPECIALIZED EXPERIENCE OF THE FIRM	10		
2	PAST EXPERIENCE OF THE FIRM WITH RESPECT TO SIMILAR LEVEL WORK	9		
3	CAPACITY OF THE FIRM TO ACCOMPLISH THE WORK WITHIN THE REQUIRED TIME	8		
4	AVAILABILITY OF EXPERIENCED KEY PERSONNEL DURING PERFORMANCE PERIOD	7		
5	LOCATION OF THE FIRM	6		
6	VOLUME OF DOD PREVIOUSLY AWARDED	5		
7	MINORITY CONSIDERATION (IF APPLICABLE)	7.5		
1				
TOTAL ASSIGNED VALUE POINTS				

ARCHITECT-ENGINEER SELECTION POINT RATING SUMMARY									
ITEMS RATED	MAX POINTS	POINT	RATING	OF	FIRM				
Recent specialized work experience	30								
Professional qualifications and availability of key personnel to accomplish work, incl subs.	25								
Capacity of firm to meet time schedule	20								
Dollar value of prior DOD awards	20								
Minority involvement	15								
Cost control, quality of work and compliance with schedule on past projs.	10								
Full time, qualified constr inspector	10								
Innovative dsn capability	10								
Location of firm	5								
Prior DOD awards	5								
TOTAL	150								
FIRM	NAME	AND	ADDRESS	OF	RATED	FIRMS			
DATE	SIGNATURE								

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VITA

Captain Mark S. Tissi was born on 11 September 1958 in St. Louis, Missouri. He graduated from Bishop DuBourg High School there in 1976 and attended the University of Missouri - St. Louis for one and one-half years prior to enlisting in the United States Air Force. He graduated with a Bachelor of Science degree in Electrical Engineering in January 1983 from the University of Arkansas under the Airman Education and Commissioning Program. Upon graduation, he received a commission as a second lieutenant through Officer Training School. He then served as an electrical design engineer in the 3800th Civil Engineering Squadron at Maxwell Air Force Base, Alabama and the 487th Civil Engineering Squadron at Ramis Air Station, Italy. He entered the School of Systems and Logistics, Air Force Institute of Technology, in May 1986.

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SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE				Form Approved OMB No. 0704-0188	
1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED			1b. RESTRICTIVE MARKINGS		
2a. SECURITY CLASSIFICATION AUTHORITY			3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution unlimited.		
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE					
4. PERFORMING ORGANIZATION REPORT NUMBER(S) AFIT/GEM/LSR/87S-24			5. MONITORING ORGANIZATION REPORT NUMBER(S)		
6a. NAME OF PERFORMING ORGANIZATION School of Systems and Logistics		6b. OFFICE SYMBOL (if applicable) AFIT/LSM	7a. NAME OF MONITORING ORGANIZATION		
6c. ADDRESS (City, State, and ZIP Code) Air Force Institute of Technology Wright-Patterson AFB OH 45433-6583			7b. ADDRESS (City, State, and ZIP Code)		
8a. NAME OF FUNDING/SPONSORING ORGANIZATION		8b. OFFICE SYMBOL (if applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER		
9. ADDRESS (City, State, and ZIP Code)			10. SOURCE OF FUNDING NUMBERS		
			PROGRAM ELEMENT NO.	PROJECT NO.	TASK NO.
11. TITLE (Include Security Classification) See Box 19.					
12. PERSONAL AUTHOR(S) Mark S. Tissi, Captain, USAF					
13a. TYPE OF REPORT MS Thesis		13b. TIME COVERED FROM _____ TO _____		14. DATE OF REPORT (Year, Month, Day) 1987 September	
15. PAGE COUNT 86					
16. SUPPLEMENTARY NOTATION					
17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)		
FIELD	GROUP	SUB-GROUP			
			Government Procurement, Architect, Engineer, and		
19. ABSTRACT (Continue on reverse if necessary and identify by block number)					
<p>Title: AN EXAMINATION OF THE SELECTION CRITERIA USED IN THE ARCHITECT-ENGINEER SELECTION PROCESS OF AIR FORCE BASE CIVIL ENGINEERS</p> <p>Thesis Chairman: Carl L. Davis, Captain, USAF Assistant Professor of Research Methods</p> <p>Approved for public release Lynn E. Wolmer 24 Sep 88 Data for: [illegible] Air Force Institute of Technology Wright-Patterson AFB OH 45433</p>					
20. DISTRIBUTION/AVAILABILITY OF ABSTRACT <input checked="" type="checkbox"/> UNCLASSIFIED/UNLIMITED <input type="checkbox"/> SAME AS RPT <input type="checkbox"/> DTIC USERS			21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED		
22a. NAME OF RESPONSIBLE INDIVIDUAL Carl L. Davis, Captain, USAF			22b. TELEPHONE (Include Area Code) (513) 255-2254		22c. OFFICE SYMBOL AFIT/LSM

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This research examined the Air Force Civil Engineering process of selecting architectural-engineering firms (A-Es) for the procurement of facility design services. Sixty-two base civil engineers (BCEs) in 35 states provided their individual scoresheets indicating the specific criteria by which A-Es are evaluated and the range of possible scores for each criterion.

Descriptive statistical methods were used to determine the criteria most commonly used by BCEs and those which are most heavily weighted in the scoring process. The analysis included a comparison between the actual criteria used and the general categories of criteria outlined in Air Force Regulation (AFR) 88-31. Finally, the research used inferential statistical methods to identify differences in the application of selection criteria used by bases of differing major commands and geographic regions.

The study's findings included a pictorial representation of the aggregated scoresheets in the form of an A-E evaluation sheet. The evaluation sheet contained the criteria identified as those most frequently assessed by BCEs and weighted in proportion to their importance as perceived by the BCEs.

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